

PlantSEED Workshop

Future of PlantSEED

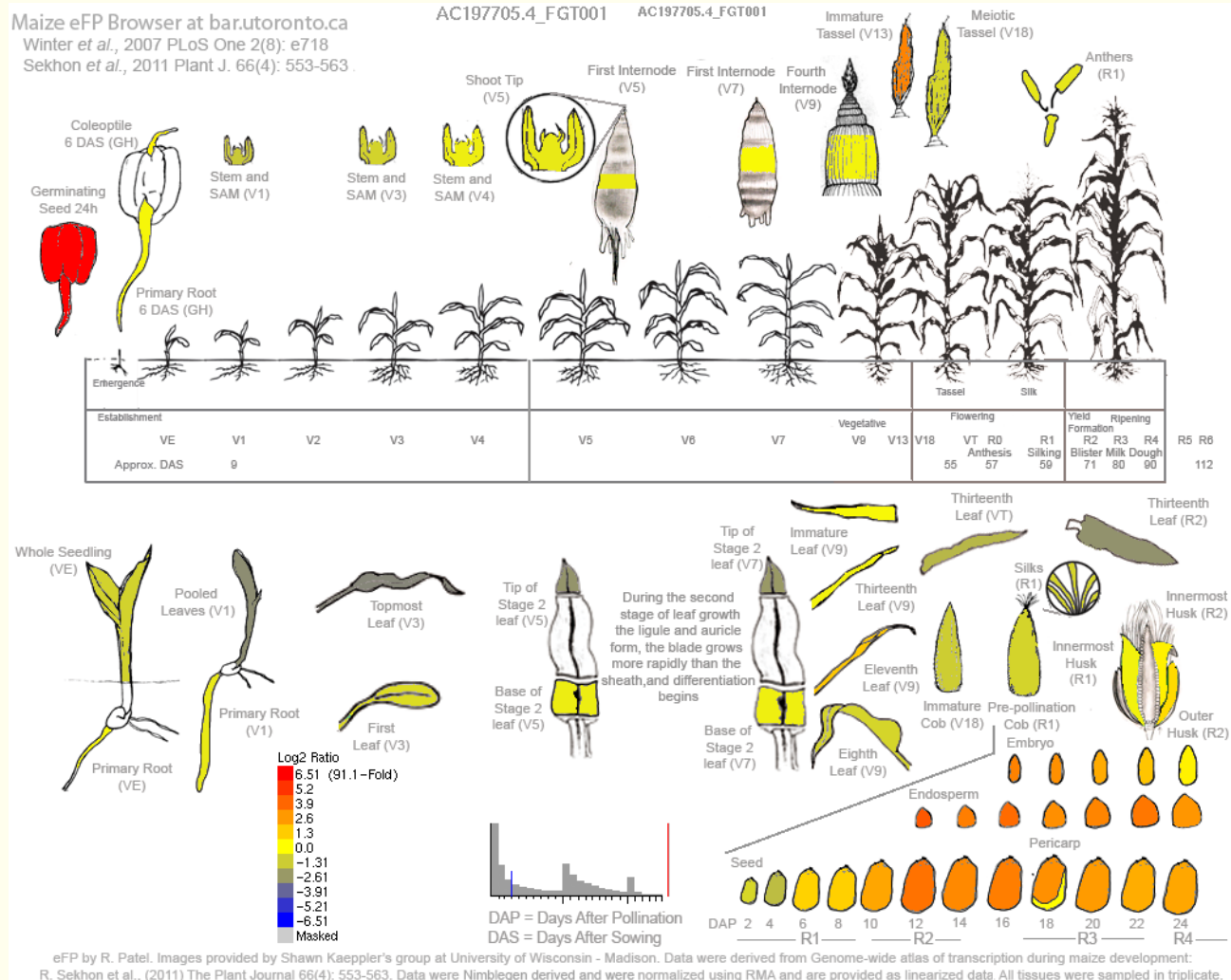
Website

- Additional functionality will be added to the website
 - Upload
 - Specific file types and data
 - Annotation
 - K-mer (fast) and BLAST (slow)
 - Download
 - Various formats
 - Genome and Model Editing
 - Provenance
 - Additional Functionality

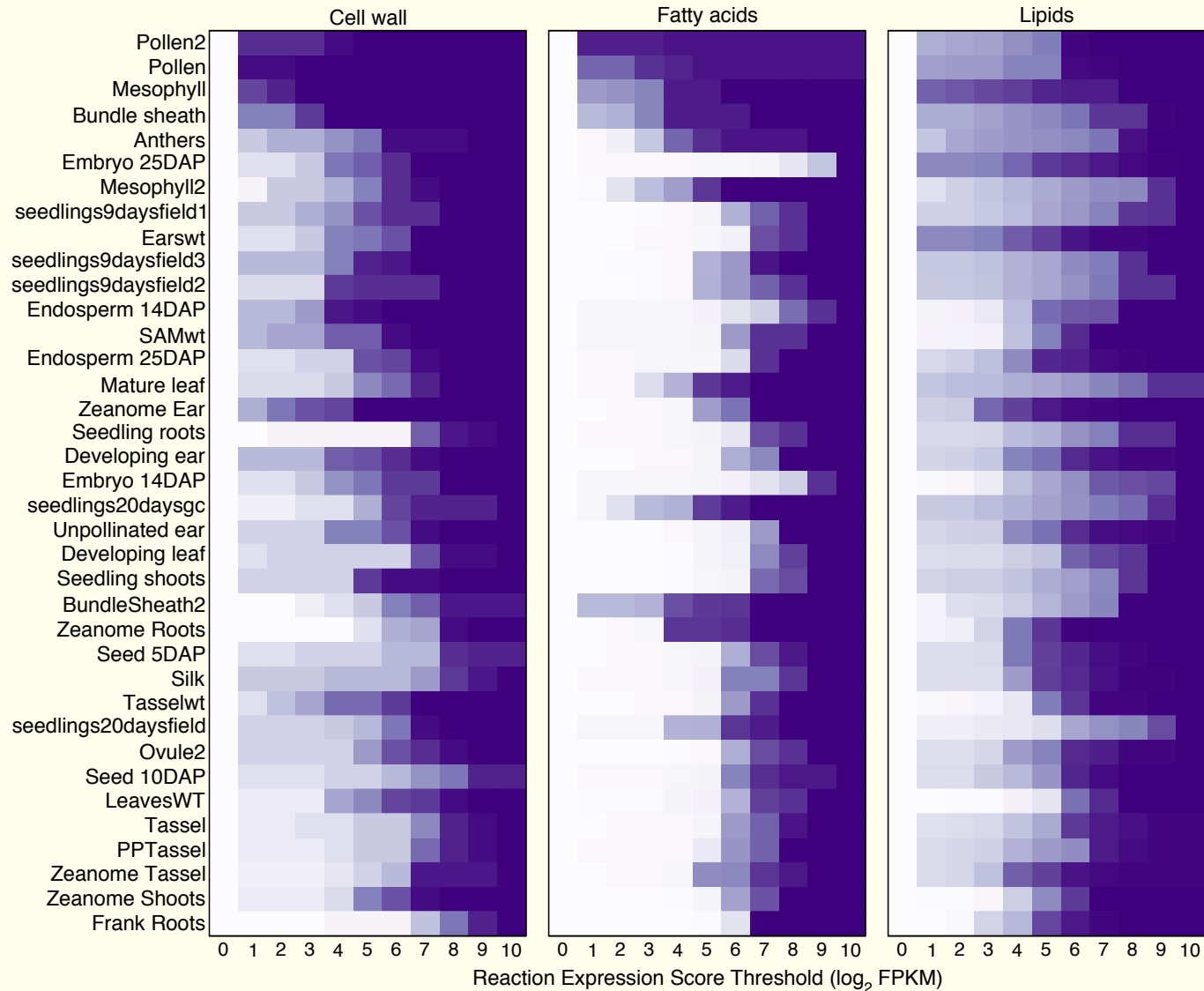
PlantSEED v2.0

- Improve coverage of plant primary metabolism
 - Train and test an improved set of K-mers
- Improve compartmentalization
 - Organellar genomes
 - Model Reconstruction Rules
 - Respiration & Photosynthesis
- Introduce Algae
 - Growing interest in metabolic engineering
- Publicly available annotation process

Refining models using transcriptomics



Variation of plant primary metabolism



Refining models using transcriptomics

- The refinement of a tissue-specific model should be functionally oriented
 - Primary function: Biosynthesize biomass
 - Curated for leaf, embryo, and endosperm
 - Secondary functions
- Simultaneous Transcriptome-based Gapfilling
 - Simultaneously
 - Biosynthesize biomass
 - Activates “high” reactions
 - Deactivates “low” reactions

Validation of tissue-specific model

Species	Model Type	Reactions	Gene-Reaction Associations	Endosperm (¹⁴ C data)	Embryo (¹⁴ C data)
<i>Arabidopsis thaliana</i>	Full	6,399	16,577	-	-
<i>Arabidopsis thaliana</i>	Evidenced	2,801	4,262	-	-
<i>Zea mays</i>	Full	6,458	35,226	0.99	0.99
<i>Zea mays</i>	Evidenced	2,629	5,540	0.99	0.83
<i>Zea mays</i>	Leaf	2,322	4,656	-	-
<i>Zea mays</i>	Embryo	2,304	4,680	-	0.83
<i>Zea mays</i>	Endosperm	2,280	4,602	0.99	-
<i>Zea mays</i>	iRS1562	1,962	-	0.69	0.43

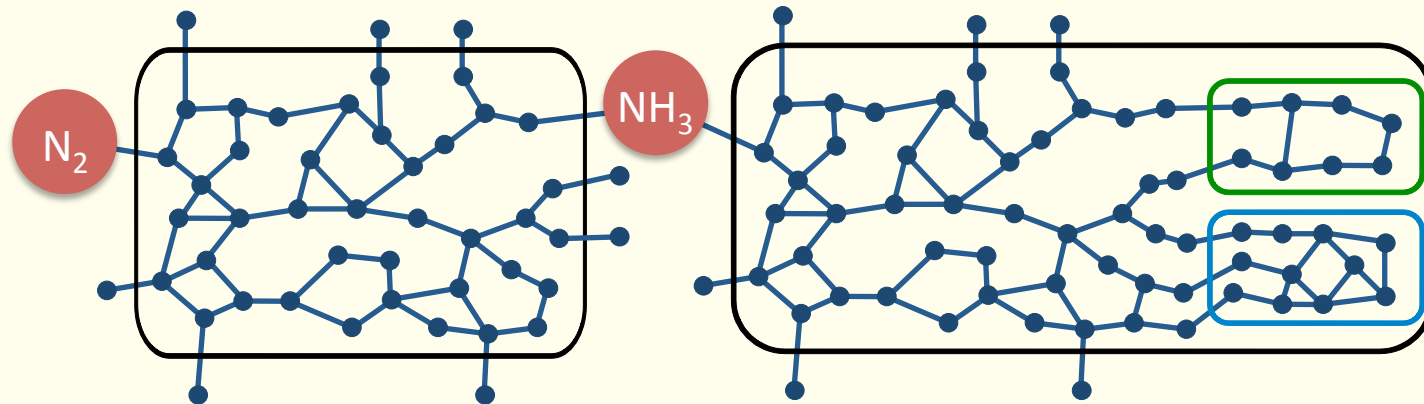
Seaver *et al.* (2015) Improved evidence-based genome-scale metabolic models for maize leaf, embryo, and endosperm. doi: 10.3389/fpls.2015.00142

Plant-Microbial Interactions

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Plant-Microbial Interactions

- The nitrogen provided for the biomass of a Sphagnum moss is fixed by a cyanobacteria



Output View FBA Result Details 10:03:19, 1/12/2015

Sphagnum_Anabaena_Model_FBA Objective: 21.4986

Reactions Compounds

Show 10 entries Search all:

Id (compartment)	Reaction Equation	Flux	upper	lower	max	min	type
rxn05466 (c2)	(l) $NH_3[c2] \rightleftharpoons (l) NH_3[e0]$	-4.30572	1000	-1000	1000	-1000	flux
rxn29241 (e0)	(l) $NH_3[c1] \rightleftharpoons (l) NH_3[e0]$	4.30572	1000	-1000	1000	-1000	flux

Showing 1 to 2 of 2 entries (filtered from 2,209 total entries)

First Previous 1 Next Last

Secondary Metabolism

- Some pathways are available in PlantSEED but a couple are specific to Arabidopsis
- Highly diversified pathways present a unique challenge
 - Idea of Last Common Metabolite (LCM) for a phylogenetic family.
 - K-mers?

Thank You!

- Comments?
- Don't forget the feedback form.